Department of the Environment and Climate Change

HM Government of Gibraltar

Building Renovation Strategy Gibraltar

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Chapter 1: Introduction

As part of its Energy and Climate Change Package, the European Union has committed to saving 20% of its final energy consumption by 2020, compared to a business-as-usual scenario based on the 2007 PRIMES model[1]. Following assessments of the energy savings achieved through the Cogeneration Directive (2004/8/EC) and the Energy End-Use Efficiency and Energy Services Directive (2006/32/EC), which showed that these were insufficient to meet the 20% target, the two directives were repealed by the Energy Efficiency Directive (EED) (2012/27/EU) in October 2012. The EED is now the most comprehensive directive on energy efficiency, covering all end-use sectors (except transport) and including the improvement of energy efficiency in the energy transformation sector[2].

Under Article 4 of the EED, Member States are required to submit a long term building renovation strategy to the Commission, as part of their National Energy Efficiency Action Plans. The overall goal of these is to increase the low renovation rates that are currently observed in the majority of Member States and to ultimately reduce significantly the energy consumption of the entire building stock by 2050, paving the way for further, more ambitious energy savings within the EU.

Gibraltar understands the opportunities lying within building renovation activities and the general adoption of energy efficiency. This strategy aims to overcome barriers and stimulate energy efficient renovation activities to fully unlock the energy savings potential in the national building stock.

[1] http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2030_update_2009.pdf

[2] http://ec.europa.eu/energy/efficiency/eed/eed_en.htm

Chapter 2: Executive Summary

Gibraltar's building stock varies widely in both age and type and consequently the energy performance of these buildings can also vary enormously. H.M. Government of Gibraltar is committed to bringing as many residential and commercial buildings as possible up to a high level of energy performance. This is in keeping with its commitments to reduce overall energy consumption and carbon emissions and to improve the comfort and well-being of the occupiers of said buildings.

Whilst Gibraltar understands the opportunities that lie within the building renovation sector, there are some significant challenges that need to be overcome before this potential can be realised. A critical issue is obtaining a better understanding of Gibraltar's building stock and it's potential.

Government is committed to removing the barriers to investment in energy efficiency and this strategy sets out the principal ways in which it intends to increase investment in the renovation of Gibraltar's building stock.

Chapter 3: An Overview of Gibraltar's Building Stock

3.1 General Overview

Gibraltar's building stock varies widely in both age and type. At present little statistical information on buildings exists[3]. One of the goals of this strategy is the development of more robust statistical data to inform future updates of the plan.

Table 1 gives an overview of the tenure structure as recorded during the last census in 2001. A 2012 census is due to be published shortly, which will allow the updating of these figures. This table therefore gives only an indication of the owner structure currently present in Gibraltar, however, it shows that nearly half of the dwellings are Government rented properties, highlighting the large amount of social housing available.

Table 1 Dwelling by Tenure, Gibraltar 2001 (Source: Abstract of Statistics 2012)

Tenure	Number	Share [%]
Govt. Rented	4276	44%
Private Rented	1338	14%
Owner Occupied	2366	24%
Co-Ownership	1655	17%
Other	82	1%
Total	**9717**	**100%**

Table 2 gives an overview of age distribution within the Government housing stock which shows that 40% of the Government housing was built before 1963.

Table 2 Government Housing Stock by Age

Date Built	Number	Share [%][4]
1940 & earlier[5]	744	13.18
1948-1952	617	10.93
1953-1957	224	3.97
1958-1962	687	12.17
1963-1967	351	6.22
1968-1972	428	7.58
1973-1977	880	15.58
1978-1982	397	7.03
1983-1987	192	3.40
1988-1992	-	-
1993-1997	86	1.52
1998-2012[6]	1041	18.43
Total	**5647**	**100%**

[3] https://www.gibraltar.gov.gi/images/stories/PDF/statistics/2013/Abstract_of_Statistics_2012.pdf

[4] The percentage figures have been rounded off from the actual figures, therefore its sum need not necessarily equal 100%

[5] A further review was undertaken of all Government housing stock. A number of adjustments have been made in respect of the period 1940 to 1972 which take account of demolished flats, modernised dwellings, houses put out to tender and dwellings sold to sitting tenants.

[6] Includes MoD housing transferred to the Gibraltar Government

The limited amount of detailed information on the building stock is not the only challenge. In addition, Gibraltar's building stock is very heterogeneous and building type is largely dependent on location, however this is not the only determining factor; buildings in Gibraltar vary greatly in quality, accessibility and style. This has a direct impact on the type of renovation activity that can be carried out on the building.

Bearing in mind the above, as well as the relatively small size of the building stock, this analysis categorises the building stock into three sectors, Public Buildings, the Old and Upper Town, and the South District. It should be understood that these are fluid borders as it is not accurate to say that all buildings in a particular category are of the same age and type. Further work will be undertaken to build in greater categorisation within these sections for identification and treatment of buildings based on their age.

Figure 1 shows a map of Gibraltar indicating the approximate location of the different defined areas:

Figure 1 The Old & Upper Town (orange) and the South District (green) of Gibraltar.

The additional categories of recent buildings and non-domestic buildings, which are mainly represented by offices, also form part of the renovation strategy to ensure that it reflects the entirety of Gibraltar's building stock. These buildings types can be found throughout Gibraltar, not only in areas identified as needing specific targeting and boosting of renovation activities.

The following sections describe each category in greater detail, as well as the challenges and opportunities faced within each.

3.2 Public Buildings

Most of the available information relates to public buildings. The age distribution among Governmental housing offers an initial indication of the overall age structure of Gibraltar's building stock; with nearly 70% of buildings having been constructed before 1980 and 40% before 1960, it is evident that a large potential for effective refurbishment exists.

The EED requires public buildings to perform an exemplary role in respect of energy efficiency and under Article 5, Member States are obliged to renovate a minimum of 3% of the total floor area of public buildings annually. Initial steps have already been taken in this respect with an LED public lighting replacement programme. An overall renovation programme for public buildings is also being developed.

Through its extensive social housing, the Government is also taking the opportunity to set an example for energy efficient renovations in the domestic sector with a number of Government owned housing projects undergoing a major refurbishment programme to include the replacement of windows with double glazing, external cladding, LED lighting and the introduction of smart metering. This is intended to pave the way for a wide adoption of these activities among individuals.

3.3 The Old & Upper Town

Buildings situated in the Old and Upper Town areas in Gibraltar contain most of its pre-war properties. There exists great potential for renovation within these areas which have been historically neglected. The reasons for this are numerous and include the serious challenges regarding accessibility, logistical difficulties and the ownership structure, as many dwellings in this area are rent-controlled with very low rates, making vacating buildings a difficult task. Additionally, exact ownership details are not always available.

As a consequence there have been very few renovations or repairs in this part of Gibraltar over the years, resulting in many buildings being left in a state of abandonment and neglect.

A renovation strategy that specifically targets the barriers faced by this part of Gibraltar has great potential to improve and preserve old houses and maintain the historical character of the area.

Through information campaigns and awareness raising, as well as through capacity building programmes to revive Gibraltar's architectural heritage, demonstration projects and through sharing of best practices, the energy performance of houses in the Old and Upper Town can be greatly improved over the coming decades.

3.4 Post War buildings and the South District

The South District contains numerous post war buildings that have not undergone renovation in recent years. This area is most suited to the deployment of a long-term renovation strategy as, whilst buildings in the area currently have acceptable energy performance levels, they will require further renovation in 20 or 30 years. A long term renovation strategy would look as far forward as 2050, meaning that these buildings would undergo a renovation phase during its lifetime.

3.5 Recent Buildings

Newer buildings are predominantly located within the North District and reclamation areas; these consist mostly of newer apartment blocks built from 1990 onwards. These buildings will have been constructed to higher standards and are unlikely to be up for renovation for another 15 to 20 years. At this point, the renovation works will adhere to the standards developed for existing buildings under the Energy Performance of Buildings legislation.

Many buildings constructed within the reclamation area in the 1990's have undergone or are undergoing major external renovation started in the last five years, bringing them in line with current Energy Performance regulations. These should not require any further renovation for another 20 to 30 years.

Figure 2 shows a map of Gibraltar indicating the approximate location of buildings constructed in the 1990's on reclaimed land:

Figure 2 Area of reclaimed land in which buildings were constructed in the 1990's (blue).

3.6 Other Non-Residential Buildings

Other than public buildings, Gibraltar's building stock includes other non-residential buildings. Little statistical information is available on the type and characteristics of these buildings, however, offices are best suited as reference buildings to represent this specific building category. For the purposes of this renovation strategy, a distinction is made between older offices that can be found in the older part of town and the south district, and newer offices that are present in the newer districts of Gibraltar and are more similar to recent buildings.

Renovation activities for the old offices will follow the measures proposed for public buildings, while the newer offices will follow typical renovation cycles from 2030 onwards, similar to new dwellings.

Chapter 4: Cost-effective Approaches to Building Renovation

Gibraltar's strategy for cost effective building renovation is largely based upon the results of the Cost Optimality Assessment carried out under the Energy Performance of Buildings Directive. The measures identified as cost effective under this analysis are used to define the most relevant approaches to renovation, taking into consideration the specific circumstances of the previously defined building categories.

The main uses of energy in buildings are cooling, and to a slightly lesser extent, heating, lighting and domestic hot water, for dwellings. Measures addressing lighting and hot water contribute to overall energy savings but the cost optimality report showed that the largest share of energy savings is associated with measures that target cooling i.e. the use of energy efficient air conditioners, measures that reduce heat gains, such as window film, solar control glazing, shading and roof insulation. Energy use for domestic hot water heating could also be reduced by the use of heat pumps or solar thermal water heaters. In offices, more energy efficient lighting and intelligent lighting systems could offer significant savings.

4.1 Public Buildings

Public buildings should play an exemplary role within the context of energy efficiency. Consequently, all of the measures that have been identified as cost effective or cost optimal should be implemented.

Table 3 Cost-effective measures and energy savings for Public buildings

Measure	Savings in primary energy consumption [%]
Auto Daylight Controls	22%
Presence sensor	2%
High efficiency air conditioner (SEER = 4.93)	15%
High efficiency air conditioner (SEER = 5.66)	20%
T5 Lamps (including hf ballast)	14%
Internal shading	8%
Package 1: (T5 Lamps with automatic control)	30%
Package 2: (T5 Lamps with automatic control and presence detector)	31%
Package 3: (High efficiency air conditioner and solar control window film)	29%
Package 4: (T5 Lamps with automatic control and presence detector, high efficiency air conditioner and solar control window film)	54%

Packages 1 to 4 denote multi-measure packages based on economic measures from the initial assessment of cost-effectiveness. Package 2 is deemed to be the closest to cost optimal levels.

4.2 The Old and Upper Town

Most buildings within the Old and Upper Town areas can be considered to have a high potential for renovation as they have high primary energy consumption levels. Applying cost effective measures is likely to result in noticeable primary energy savings.

Focus is based on activities that are easy to carry out, even if access to the site is difficult. In order to support renovation in this part of town, the Government will work with the Gibraltar Heritage Trust and others, to develop guidelines for energy performance management in historic buildings to act as a support document for this renovation strategy. In any event, buildings in the Old and Upper town will be considered on a case by case basis. The installation or replacement of timber window shutters is also recommended for most buildings in this area, as they allow for shade and ventilation and have long life expectancies if correctly maintained. Information and advice in this respect will also be contained in the aforementioned guidelines.

Table 4 Cost-effective measures and energy savings for the Old and Upper Town

Measure	Savings in primary energy consumption [%]
High efficiency air conditioner (SEER = 4.93)	18%
High efficiency air conditioner (SEER = 5.66)	25%
Internal shading	4%
Package 1: (High efficiency air conditioner and internal shading)	25%
Package 2: (High efficiency air conditioner and internal shading, roof insulation)	53%
Roof insulation: U value= 0.1	45%

For this reference building package 2 was also identified as being closest to a cost-optimal solution.

4.3 Post War Buildings & the South District

Buildings in this category are considered to have a higher energetic quality than pre-war buildings but are still likely to require renovation over the next few years. Care should therefore be taken to ensure that as a minimum, cost effective measures are applied when these buildings are renovated. Further assessments will be undertaken in future reporting to determine the energy performance levels that these buildings should achieve in the next phase of renovation, in 15-20 years' time.

It should also be noted that the South District contains a number of historic Georgian and Victorian properties, as well as concentrations of vernacular houses and streetscapes, which

cannot be treated in the same way as more modern structures. Buildings of this nature should follow the guidelines for historic buildings as highlighted in the previous section.

Table 5 Cost-effective measures and energy savings for the South District

Measure	Savings in primary energy consumption [%]
High efficiency air conditioner (SEER = 4.93)	14%
High efficiency air conditioner (SEER = 5.66)	19%
Internal shading	12%

4.4 Recent Buildings

Other buildings found in newer residential areas in Gibraltar have been built in compliance with current building regulations. As highlighted in the cost optimality assessment report, these regulations are more than 15% below the cost optimal level for energy performance therefore potential does exist for cost effective renovation options.

Table 6 Cost effective measures and energy savings for recent buildings

Measure	Savings in primary energy consumption [%]
High efficiency air conditioner (SEER = 4.93)	25%
High efficiency air conditioner (SEER = 5.66)	28%
Glazing u=2.8	6%
Light (t= 0.25), solar t =0.25	26%
Package 1 (High efficiency air conditioner and Glazing)	11%
Package 2 (High efficiency air conditioner and improved lighting)	28%

4.5 Other Non-Residential Buildings

Older offices should follow the guidelines established for public buildings (see Table 3).

For newer offices on the other hand, the measures included in Table 7 should be considered.

Table 7 Cost-effective measures and energy savings for newer non-residential buildings

Measure	Savings in primary energy consumption [%]
Auto Daylight Controls	4%
Presence sensor	1%
High efficiency air conditioner (SEER = 4.93)	10%
High efficiency air conditioner (SEER = 5.66)	14%
T5 Lamps (including hf ballast)	2%
Internal shading	1%
Light (t= 0.25), solar t =0.25	2%
Light (t= 0.70), solar t =0.50	1%
Package 1: (T5 Lamps with automatic control)	16%
Package 2: (High efficiency air conditioner and solar control window film)	15%
Package 4: (High efficiency air conditioner, solar control window film and roof insulation, also T5 Lamps with automatic daylight control)	32%

Of all cost effective measures, package 1 is identified as being closest to the cost optimal point. Other measures show further potential for energy reduction, however they are associated with higher costs, for example package 4.

Chapter 5: Policies to stimulate cost effective Deep Renovation

5.1 Measures to stimulate energy efficiency

There are various instruments that can be applied in order to address the barriers to energy efficient renovation in buildings. These include inter alia, financial instruments, information and awareness raising campaigns, public-private partnerships, institutional strengthening and capacity building. Table 8 below, gives an overview of the common policy measures used by Member States to stimulate energy efficiency measures.

Table 8 Common policy instruments in EU to stimulate EE measures[7]

Policy type	Specific policy instruments
Regulatory instruments	• Regulatory benefits for above-standard energy performance • Mandatory environmental performance evaluation with minimum requirements • Above-standard requirements for government buildings • Energy upgrading requirements when renovating a building
Economic instruments (BPIE,2011)	• Grants/subsidies/fund (Financial incentives) • Loans(Financial incentives) • Tax/VAT incentives (Fiscal measures) • Energy Supplier Obligations (white certificates) • Third party financing/Energy Performance contracting • Levies
Communicative instrument	• Building energy performance audits • Demonstration projects • Voluntary energy conservation agreements
Organisational Instrument	• Independent energy audits with organisational support • Professional management for multi-family housing • Independent verification of sustainable real estate investments • Energy performance advice • Energy service contracts

The package of measures should be chosen such that it best addresses the country-specific needs and barriers. Therefore, BPIE (2012)[8] has identified 132 discrete financial programmes which were on-going in the European Union in 2011. Figure 3 depicts the number of identified programmes by type of financial instrument and country. It is evident that grants and subsidies are the most widespread type of financial schemes, followed by preferential loans and tax reduction. Reduced VAT is of growing importance while only a few Member States use a tax credit. While most of the financial programmes, grants/subsidies, preferential loans and fiscal incentives (tax reduction, tax credit, reduced VAT) are directed at existing buildings, only a few target exclusively new buildings.

[7] EURIMA,2006, Better buildings through energy efficiency: A Roadmap for Europe http://www.eurima.org/uploads/ModuleXtender/Publications/40/EU_Roadmap_building_report_020307.pdf

[8] BPIE,2012, Energy efficiency policies in buildings –The use of financial instruments At member state level http://bpie.eu/documents/BPIE/publications/BPIE_Financial_Instruments_08.2012.pdf

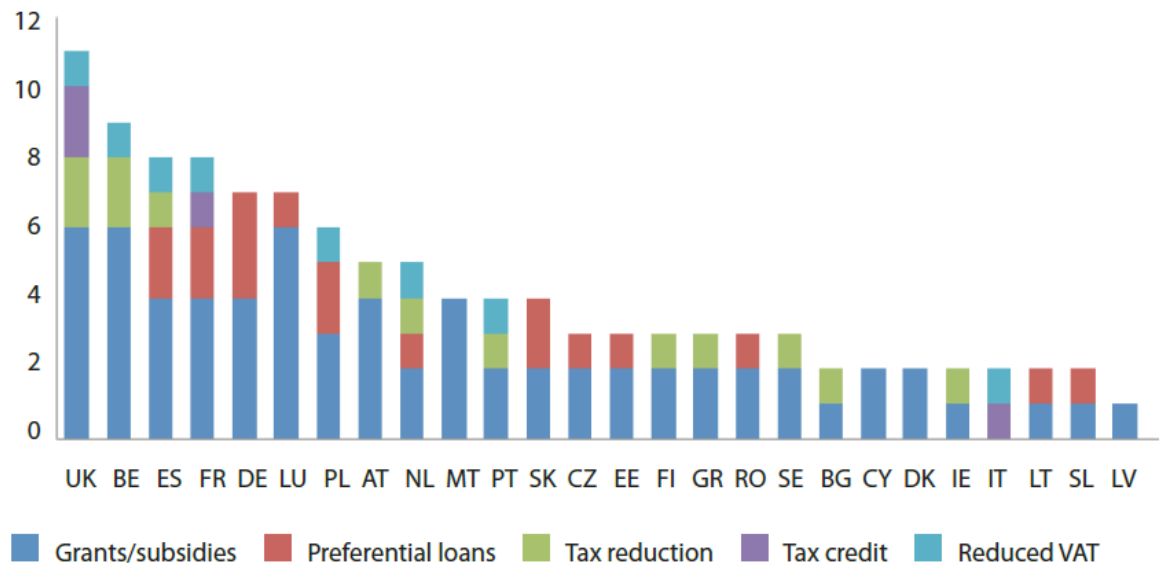

Figure 3 Number of financial instruments in place in 2011 by country (BPIE, 2012)

A holistic approach to building renovation is likely to yield better results in terms of deep renovations, due to the high upfront costs associated with a deep retrofit. More innovative ideas and initiatives will be necessary as, although deep renovations are cost effective in the long term, they are costly in the short term. The considerable upfront capital is normally beyond the support of any single financial instrument.

However, financial instruments are not the only tools available for stimulating renovations. Creating awareness of energy efficient renovation among the general public through information campaigns, energy audits and demonstration projects, can contribute to creating a stimulus towards renovation projects at an individual level. Regulatory instruments can also offer ways to ensure that renovation is carried out effectively and with the desired level of ambition, for example, by making energy upgrades when renovating a building mandatory, or setting an example through the above standard requirements for Government buildings.

Renovation roadmaps set out to deliver long-term transformational change, while maintaining a dynamic character that can be easily adapted to changing national circumstances. It is therefore useful to divide suitable measures into groups that aim to stimulate renovation on short, medium and long-term timescales. This allows for flexibility of the strategy, as short-term measures can be evaluated and adapted accordingly and long-term measures to be developed over time to increase their effectiveness through lessons learned from short and medium-term examples.

5.2 Short Term (2014 – 2020)

Gibraltar is already on its way to increasing building renovation through measures planned under the newly designed Energy Efficiency Obligation Scheme, as well as measures targeting the building sector as presented in Gibraltar's National Energy Efficiency Action Plan (NEEAP).

Public measures

The **Green Business Programme** is a Government initiative to adopt sustainable and greener practices within Government Departments, with a view to extending these to the private sector. Key principles include the adoption of green procurement practices; complying with legislative and regulatory requirements and applying the best available techniques and striving for continuous improvement on sustainability as well as promoting environmental management systems. An ongoing programme of seminars and workshops to deal with any problems or queries from departments is planned.

The installation of **solar thermal systems** on public buildings is one of the Government's key initiatives. Systems have already been installed at the community sports facility, the community swimming pool and children's home; with further works planned for the hospital. Government continues to review its existing building stock to maximise the use of suitable and available roof space.

Public building refurbishment is ongoing. Any refurbishment must now include the replacement of existing lighting with LED lighting. Government housing estates are also undergoing a process of renovation to include the replacement of windows with double glazing, installation of external cladding, LED lighting and the introduction of smart metering.

Building sector

A **financial scheme for environmental improvements** exists whereby residential estates are able to apply for soft loans at a preferential interest rate in order to carry out works that result in environmental improvements through renewable energies and energy efficiency measures. This includes installation of PV and replacement of lighting systems with LED.

A **tax relief scheme** has also been introduced which offers households tax relief of up to £3000 upon installation of **solar water heating systems or PV systems**.

A further **grant scheme** is planned whereby individuals will be able to apply for fixed sums of money for certain building improvements, such as window replacement, roof insulation, replacement of HVAC systems and replacement of lighting with LED.

Commercial sector

Within the commercial sector, loan schemes are planned to promote energy efficient technologies and processes (e.g. ICT, cooling devices and pumps) as well as the provision of grants to encourage energy audits for SMEs.

Government will also look into introducing an **energy efficiency reporting scheme** which would require all businesses and Government Departments in Gibraltar to submit yearly reports about their energy use and the measures they are implementing to reduce this. The scheme for the commercial sector will be supported by a **reduction in rates** for those entities able to demonstrate reductions in their energy use.

Government will undertake a **comprehensive survey of its building stock** in order to better understand it and the challenges it currently faces. This will ensure that chosen measures in the medium to long term scale are appropriate and deliver the greatest improvements to the energy performance of the building stock.

Beyond this, the Government will work with the Town Planning Department to ensure that any renovation activities carried out on buildings in the coming years include the appropriate actions to improve energy performance. Work will also be done to try to increase the current slow rate of renovation of older buildings to 3% by 2020, to ensure that these buildings are renovated steadily throughout the duration of the long term strategy.

The remaining key task for the short-term period is the implementation and enforcement of identified measures, as well as the setting up of robust monitoring and verification systems to assess the impact of these measures.

5.3 Medium Term (2021 – 2034)

In the medium term it will be necessary to evaluate the measures already implemented to determine their effectiveness in moving towards the deep renovation of Gibraltar's existing and dated building stock. It is likely that during this time, new requirements will be put in place by the EU and updates of the NEEAP and other national strategies, will offer the opportunity to raise ambition levels for renovation.

During this time, Government will maintain a **strong focus on public buildings**, including Government housing, to further develop these buildings into positive leading examples for energy efficient renovation. Positive examples that demonstrate how households can reduce their energy bills, while simultaneously increasing their comfort of living, can increase awareness as well as public interest in renovation and consequently encourage private sector renovation activities.

Replacement of appliances and HVAC systems follow typical lifecycles. As a major procurer in the local market Government can **increase the share of high standard energy efficient technology** and make sure that these technologies remain at competitive prices for consumers.

During this period, the renovation strategy will be further evaluated, barriers identified and the strategy adjusted accordingly. The renovation rate will be kept stable at 3% with renovations carried out at cost optimal levels.

5.4 Long term (2035 – 2050)

In the long term, Government will ensure that **continuous evaluation and assessment of effectiveness** is carried out for the measures formulated and implemented in the short and medium term. After 2035, the focus of the renovation activities should shift to the remaining old and difficult buildings that have not undergone (full) renovations by then. It is likely that by this time, technologies and best practice examples will have emerged with the potential to tackle the logistical barriers faced by many of Gibraltar's older buildings. This time frame will specifically target dwellings to ensure that by 2045/2050 buildings of all ages in Gibraltar have undergone renovation.

By this time the majority of buildings currently considered 'new' will be up for renovation and it is critical that this be carried out in an appropriate manner, using insights and technological advances, reached in the previous years.

Existing measures will be adapted according to the specific needs identified during the past 20 years of renovation and new measures designed and implemented to ensure that the last 15 years of the strategy deliver a higher share of refurbished buildings with improved energy standards, in light of targets set by the EU.

Chapter 6: Forward Guidance for Investment

6.1 Barriers to Energy Efficient Renovation

There are certain factors that hinder the execution of energy efficiency renovations of existing buildings. By understanding the specific barriers faced within Gibraltar, Government can then provide support by implementing measures that address these factors and can help remove obstacles to retrofitting projects. This is likely to include providing support for technical and procurement expertise, facilitating the contracting out of efficiency retrofits to companies, streamlining project approval procedures or providing technical assistance.

Gibraltar is currently in the stage of investigating and collecting data, including the assessment of the main barriers, both regulatory and non-regulatory, which are hindering the adoption of energy efficient practices and technology. Initial stakeholder consultations have identified the following main barriers, which have been evaluated for their severity within the three categories of buildings addressed in this first section of the renovation strategy. It should be noted that recent buildings were not specifically considered during the stakeholder consultation as it is generally agreed that these buildings are generally of a better quality and do not demand action in the next few years.

Table 9 Key barriers to energy efficiency in Gibraltar, rated severe (pink), moderate (orange) and none (green)[9]

Barrier Category	Barrier Description	Old & Upper Town	South District	Public Buildings
Financial/ Economic	Split incentives: the occupant –tenant issue			
	Lack of availability of affordable cost-of-capital finance to project developers/end users.			
	High upfront investment costs for EE compared to other options			
Institutional/ Political	Unclear procedures and/or complex interactions and lack of coordination between the various authorities involved			
	Lack of enforcement of existing building codes or standards			
Technical	Lack of space (for entry of equipment, supporting structures etc.)			
	Work needs to be carried out while building is occupied			
Informational/ Capacities	Lack of awareness of benefits/options of EE			
	Lack of technical knowledge and skilled professionals			
Social, cultural & behavioural	Impression that EE does not fit streetscapes, way of living			

[9] Newer buildings found in other areas in Gibraltar are not considered, as they currently are not affected by these barriers.

It is evident that buildings in the Old and Upper Town area face the greatest barriers and that many of the barriers, particularly in respect of financial as well as institutional barriers, can best be influenced by the Government. The greatest potential for overcoming barriers to energy efficiency in buildings on a short term scale lies within public buildings and housing owned by the Government.

Major barriers faced by buildings in the Old and Upper Town area are accessibility, split incentives and the high upfront costs of energy efficiency measures; barriers that also hinder renovation activities within other areas. The challenges highlighted present only moderate barriers to renovation activities for relatively new buildings. These will need to be renovated in the next decade and beyond, and so the barriers faced here should be targeted in more detail within the next stage of renovation.

Several barriers apply to all of Gibraltar's buildings, most notably those barriers fall into the category of Information and Capacity. An overall lack of awareness in the general population, as well as lack of technical knowledge and skill within the building market, is a major challenge; which is being addressed and tackled as a matter of urgency in order to move energy efficient construction and renovation forward. Measures include the Environmental and Sustainable Construction Course, offered by the Department of the Environment to raise awareness both in the public and private sector on sustainable construction practices. The Department of the Environment is also ensuring that the requirements under the Energy Performance of Buildings and Energy Efficiency Directive are being met through the town planning and building application process. The Department of the Environment has also launched an energy efficiency campaign to help raise awareness of energy saving measures.

6.2 Measures to Address Barriers

There are various instruments available to address the barriers to investment in building energy performance improvements, including (but not limited to) financial instruments, information and awareness raising campaigns, public-private and public partnerships, institutional strengthening and capacity building. The effectiveness of any given measure needs to be continuously evaluated to ensure that it is having the desired effect. Measures must be adapted and extended according to the results of this evaluation.

Based on the initial results from the barrier analysis, this strategy will extend the set of measures beyond financial instruments to include regulatory, organisational as well as communication instruments, to address the wide range of barriers addressed by Gibraltar's building stock. A training component to build up the relevant capacity within the construction

industry will also be introduced. Table 10 gives an overview of the different barriers in Gibraltar and suitable policy options to address them.

Table 10 Barriers and matching policy instruments to address them

Barrier Category	Policy instruments that address these	Examples for Gibraltar
Financial/Economic	Economic instruments	• Grants/fund (Financial incentives) • Loans (Financial incentives) • Tax/VAT incentives (Fiscal measures) • Energy Performance contracting
Institutional/ Political	Regulatory instruments	• Minimum requirements • Above-standard requirements for Government buildings • Energy upgrading requirements when renovating a building • Simplified planning procedures together with improved enforcement
Technical	Education and training Communication instruments	• Training programmes • Outside consulting, best practices other countries • Best practice guidance
Informational/ Capacities	Organisational Instrument, Communication instruments	• Independent energy audits with organisational support • Professional management for multi-family housing • Independent verification of sustainable real estate investments • Energy performance advice • Energy service contracts
Social, Cultural and Behavioural	Communication instrument	• Building energy performance audits • Demonstration projects • Voluntary energy conservation agreements • Information Campaigns

Tax relief is currently offered on external building works, however it is not linked to energy performance targets. Government will expand the existing tax incentive scheme to encourage greater renovation and re-use of historic buildings, as set out in the 2014 NEEAP. Due to Gibraltar's small size and the small number of relevant sectors, consumer behaviour and buying decisions, are even more crucial to the successful adoption of energy efficient measures than in other EU member states. As a result, energy advice services, as well as incentive schemes for the replacement of old equipment such as HVAC systems and appliances, are likely to yield good results.

Public buildings will be renovated at a rate of 3% per annum, in accordance with commitments under the NEEAP. Government will ensure that public buildings take up an exemplary role in order to encourage greater uptake of energy efficiency renovation activities.

Next to economic instruments, the most effective measures for the Old Town are those of information/communication, the predominant barriers relate to a lack of awareness, misinformation and lack of technical knowledge. Specific steps that will be taken to tackle these issues include:

- The creation of a forum for local architects/ designers to increase knowledge and share best practice.
- The development of an information brochure in conjunction with the Heritage Trust on energy efficient renovation in the Old Town.
- A demonstration project with the Heritage Trust to showcase best practice in the renovation of old buildings and preservation of Gibraltar's streetscape. This would allow the test driving of policies and appropriate materials and allow the quantification of resources for the real time renovation of historic buildings.
- Training scheme for learning and sharing skills in traditional building repair. This is considered essential to ensure the long term survival of our historic building stock and will help to create a sustainable building industry for Gibraltar.

Financial incentives also need to be provided and, as set out in the 2014 NEEAP, the Government will be providing financial assistance for the replacement of windows, lighting and roof insulation with energy efficient alternatives. With regards to windows in particular, care must be taken that any replacements preserve the proportions and character of the buildings and historic streetscapes. The Heritage Trust is developing a paper on this which will be presented to Government and the Development and Planning Commission for incorporation as planning policy.

6.3 Guide for Investment Decisions

The renovation strategy will only be effective if it manages to engage with sufficient numbers of stakeholders to support its implementation and drive it forward. Article 4 of the Energy Efficiency Directive requires Member States to create a guide to investment decisions for individuals, the construction industry and financial institutions. Supplying these actors with the correct tools will enable them to embrace the strategy and carry it forward.

Individuals

There is a lack of awareness among the general public about energy efficiency in buildings, both in terms of the benefits it provides and in how to go about achieving it. A key part of this strategy is therefore providing individuals with the information and advice they require in order to make intelligent decisions about their renovation options.

Information will therefore be provided on energy savings achievable through renovation and the most suitable renovation measures for different building types and information on local supplies and contractors. The Department of the Environment will work closely with the Heritage Trust in the development of these guidelines.

The renovation strategy itself will also be published, and the public made aware of the specifications and requirements contained therein, as well as the role that individuals play in raising renovation ambition.

Construction Industry

Gibraltar has a small but vibrant construction industry and their collaboration in the implementation of this strategy is critical to its success. It is also vital that corresponding capacities are built up so that skilled professionals are available to put the theory into practice.

Building professionals are informed of the new standards and energy performance levels being targeted and these are reinforced by the Development & Planning Commission.

The Government will organise seminars and workshops to ensure that all members of the industry are given the opportunity to learn the skills necessary to ensure the sensitive and efficient renovation of our building stock. Some work has already been done in this respect with the delivery of a course on Sustainable Construction by the UK's Green Register. However, further courses will be required to ensure the necessary levels of expertise.

Financial Institutions

Gibraltar's renovation strategy depends on several loan and grant schemes. Some of these will be managed by the Government itself; however it is important that financial institutions are made aware of the new instruments, so that they can set up suitable financial products, with conditions that help overcome financial barriers by addressing consumer needs. Financial institutions will need sufficient time to develop this product including marketing material so that consumers can easily determine the best product for their renovation product.

The Department of the Environment will work closely with the Ministry of Finance and the Financial Services sector to deliver this.

Appendix A: Evidence Based Energy Savings Calculations

In general, building renovation as set out in Article 4 will amount to relatively small savings by 2020, as it will take some time for renovation measures and incentives to take form and gather momentum. More savings can be expected in the period from 2020 to 2050 when the renovation road map is further expanded upon and implemented.

Based on statistical data and the findings and assumptions made for the Cost Optimality Assessment of the EPBD, initial rough energy savings estimations have been made that point towards the potential for energy savings lying within Gibraltar's building stock.

Residential Buildings

Based on roof areas, around 44% of Gibraltar's building stock is made up of residential buildings. Of the 9,700 households counted in Gibraltar's last Census in 2001, 44% were Government owned. Although the number of households has grown since the last census, the new households will mainly consist of new buildings which will be due for renovation at a later stage. Therefore, this first version of the renovation strategy specifically targets older residential as well as public buildings, as these buildings offer the greatest potential while at the same time facing the greatest challenges. Table 61 gives an overview of the owner structure and the number of households that can be found in the different areas of Gibraltar.

Table 6 Owner Structure and number of households in the different areas

Owner Structure	East Side	North District	Reclamation Areas	Town Area	Upper Town	Sandpits	South District
Government Rented house/Flat	66	1262	1003	129	723	633	460
Private rented House/Flat	10	101	128	832	109	18	140
Owner Occupier House/Flat	72	233	596	422	115	186	742
Co-Ownership	0	0	1587			0	68
Other	4	6	18	11	3	0	23
Total	**152**	**1602**	**3332**	**1394**	**950**	**837**	**1433**

Based on these data, the households/dwellings were divided into Government owned as well as privately owned property, in order to highlight the number of dwelling renovations which fall under the responsibility of the Government of Gibraltar.

Non-residential Buildings

As well as public buildings, this first version of the renovation strategy also targets offices, as the main non-residential building type within Gibraltar. Due to the lack of available data, assumptions were made regarding the square meterage of office space available. Within the EU, an average of 2.4 m^2 of non-governmental office type building, are present per person in the population[10]. Therefore for the different areas in Gibraltar this assumes the m^2 of office space as listed in Table 7.

Table 7 People living in the different districts and EU average corresponding m^2 of office buildings

Owner Structure	East Side	North District	Reclamation Areas	Town Area	Sandpits	South District
Number of people	429	4116	9599	3588	2207	4257
m^2 of office buildings	1030	9878	23038	8611	4237	8173

In terms of reference buildings, the offices found in the Town Area, the Upper Town and the South District, are represented by the *existing non-domestic building* and the offices found in the other areas, are represented by the *new non-domestic buildings* from the cost optimality assessment.

Based on the provided information on floor area and roof top area it was estimated that Gibraltar has around 40 public buildings, which include Governmental buildings, as well as schools and other facilities.

Renovation Rates and Activities

In order to increase the renovation activities as well as take into account the other tasks Gibraltar faces to fulfil national as well as European requirements, the renovation rates (share of the building stock in m² that is renovated per year) are targeted to increase gradually over the next 5 years and to then stabilise at 3% from 2020 onwards.

Table 83 Targeted renovation rates for the next 5 years and beyond

Year	Targeted renovation rate
2015	1.0 %
2016	1.25 %
2017	1.5 %
2018	2.0 %
2019	2.5 %
2020 - 2050	3 %

[10] Ecofys 2011. Panorama of the European non-residential construction sector. By order of European Copper Institute

Three percent is an ambitious renovation rate, but studies show that it is a common target within the EU for long-term renovation roadmaps. The renovation activities that have shown to be cost optimal for Gibraltar include building shell renovation, which typically follows slower renovation rates of approx. 2%, as well as the replacement of HVAC systems, which have renovation rates of around 5% due to the normal life cycle of these systems. Therefore 3% represents a suitable mean value. The 3% thereby represents full renovation equivalences (renovation of building shell and energy system) while the actual implementation might be stepwise.

Under this method it is assumed that over the course of the renovation activities, cost optimal levels are achieved through full renovation, as well as through partial renovation of dwellings and other buildings to cost optimal level that in total amount to the value of full renovations as targeted by the strategy.

Based on these assumptions the following number of public buildings, dwellings as well as m^2 of office buildings, will be up for renovation in the short term from 2015 till 2024, with renovation rates stabilizing at 3% after 2019.

Table 94 Number of buildings each year targeted for renovation, by government and citizens (2015-2024)

	Status	Shares	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Public Buildings	75	1.9%	1	1	1	2	2	2	2	2	2	2
Old Town	1265	32.8%	13	16	19	25	32	38	38	38	38	38
Old Town - Gov	129	3.3%	1	2	2	3	3	4	4	4	4	4
Upper Town	227	5.9%	2	3	3	5	6	7	7	7	7	7
Upper Town - Gov	723	18.8%	7	9	11	14	18	22	22	22	22	22
South District	973	25.3%	10	12	15	19	24	29	29	29	29	29
South District - Gov	460	11.9%	5	6	7	9	12	14	14	14	14	14
Recent Buildings	2959											
Recent Buildings - Gov	2964											
old offices [m²]	25560	in m²	256	320	383	511	639	767	767	767	767	767
newer newer offices [m²]	39242	in m²										
Govt Activities (old)	1387	36.0%	14	17	21	28	35	42	42	42	42	42
Citizens (old)	2465	64.0%	25	31	37	49	62	74	74	74	74	74

During these first 10 years the Government of Gibraltar will focus on raising awareness of the benefits and necessity of building renovation, as well as collecting more data on its building stock, including monitoring any changes and improvements. In 2015, the Government will need to renovate 13 dwellings and 1 public building to cost optimal level. This number steadily increases until 2020 where it stabilizes to an overall 40 dwellings and 2 public buildings per year. Following this rate, all Government owned buildings and flats will be renovated before 2050.

In 2014, the Government embarked upon a major renovation project of Government Estates; including Moorish Castle Estate (9 blocks), Glacis Estate (10 blocks) and Laguna Estate (34 blocks). Renovation works include the replacement of all existing windows and blinds with high quality double glazed windows and external roller blinds. To the façade, outsulation

cladding to improve the performance of the external envelope and new composite cladded roofs with high performance insulation.

Through measures outlined in the previous chapter as well as Gibraltar's Energy Efficiency Obligation Scheme, e. g. awareness raising campaigns, training of professionals as well as grant schemes, it is expected that renovation activities will be boosted in the coming years. Similar to the activities targeted by the Government, 25 privately owned dwellings will have to be renovated in 2015 and the number slowly increased to 74 dwellings by 2020.

It is further assumed that renovation activities in recent buildings of 1990 and beyond will not begin before 2030. A similar assumption is made for the newer office buildings.

Table 105 through 17, give an indication of the targeted number of public buildings, dwellings, as well as m^2 of offices, subject to renovation each year if following a renovation rate of 3%. The newer buildings and offices will start undergoing renovation only after 2030.

Table 10 Number of buildings each year targeted for renovation, by Government and citizens (2025-2034)

	Status	Shares	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Public Buildings	75	1.9%	2	2	2	2	2	2	2	2	2	2
Old Town	1265	32.8%	38	38	38	38	38	38	38	38	38	38
Old Town - Gov	129	3.3%	4	4	4	4	4	4	4	4	4	4
Upper Town	227	5.9%	7	7	7	7	7	7	7	7	7	7
Upper Town - Gov	723	18.8%	22	22	22	22	22	22	22	22	22	22
South District	973	25.3%	29	29	29	29	29	29	29	29	29	29
South District - Gov	460	11.9%	14	14	14	14	14	14	14	14	14	14
Recent Buildings	2959							89	89	89	89	89
Recent Buildings - Gov	2964							89	89	89	89	89
old offices [m²]	25560	in m²	767	767	767	767	767	767	767	767	767	767
newer newer offices [m²]	39242	in m²						1177	1177	1177	1177	1177
Govt Activities (old)	1387	36.0%	42	42	42	42	42	42	42	42	42	42
Citizens (old)	2465	64.0%	74	74	74	74	74	74	74	74	74	74

Table 11 Number of buildings each year targeted for renovation, by Government and citizens (2035-2040)

	Status	Shares	2035	2036	2037	2038	2039	2040
Public Buildings	75	1.9%	2	2	2	2	2	2
Old Town	1265	32.8%	38	38	38	38	38	38
Old Town - Gov	129	3.3%	4	4	4	4	4	4
Upper Town	227	5.9%	7	7	7	7	7	7
Upper Town - Gov	723	18.8%	22	22	22	22	22	22
South District	973	25.3%	29	29	29	29	29	29
South District - Gov	460	11.9%	14	14	14	14	14	14
Recent Buildings	2959		89	89	89	89	89	89
Recent Buildings - Gov	2964		89	89	89	89	89	89
old offices [m²]	25560	in m²	767	767	767	767	767	767
newer newer offices [m²]	39242	in m²	1177	1177	1177	1177	1177	1177
Govt Activities (old)	1387	36.0%	42	42	42	42	42	42
Citizens (old)	2465	64.0%	74	74	74	74	74	74

Table 12 Number of buildings each year targeted for renovation, by Government and citizens (2041-2050)

	Status	Shares	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Public Buildings	75	1.9%	2	2	2	2	2	2	2	2	2	2
Old Town	1265	32.8%	38	38	38	38	38	38	38	38	38	38
Old Town - Gov	129	3.3%	4	4	4	4	4	4	4	4	4	4
Upper Town	227	5.9%	7	7	7	7	7	7	7	7	7	7
Upper Town - Gov	723	18.8%	22	22	22	22	22	22	22	22	22	22
South District	973	25.3%	29	29	29	29	29	29	29	29	29	29
South District - Gov	460	11.9%	14	14	14	14	14	14	14	14	14	14
Recent Buildings	2959		89	89	89	89	89	89	89	89	89	89
Recent Buildings - Gov	2964		89	89	89	89	89	89	89	89	89	89
old offices [m²]	25560	in m²	767	767	767	767	767	767	767	767	767	767
newer newer offices [m²]	39242	in m²	1177	1177	1177	1177	1177	1177	1177	1177	1177	1177
Govt Activities (old)	1387	36.0%	42	42	42	42	42	42	42	42	42	42
Citizens (old)	2465	64.0%	74	74	74	74	74	74	74	74	74	74

This renovation roadmap will allow for renovation of all older buildings in the areas of the Old Town, Upper Town and South District, as well as all public buildings and older offices, before 2050. Of the newer buildings and offices, 63% will be renovated by 2050.

Possible Achievable Primary Energy Savings

Based on the previous numbers on renovation activities needed to be carried out each year, the energy savings can be calculated. Full renovation equivalences to cost optimal levels are being used to determine the energy savings from the renovation activities.

The possible energy savings that correspond to this, for the different buildings and dwellings found in the different areas, are listed in Table 13. The measures or packages of measures corresponding to these energy savings have been discussed in Chapter 4.

Table 13 Possible energy savings per reference building

Category	Possible primary Energy Savings per Renovated Building [MWh]
Public buildings	12.7
Old & Upper Town	21.6
South District	3.9
Recent Buildings	7.3

For the old offices, energy savings of around 143 kWh/m^2 can be achieved and for the newer offices, energy savings of 58 kWh/m^2 through the identified cost optimal measures.

These energy savings levels result in a reduction in primary energy consumption as shown in Figure 4.

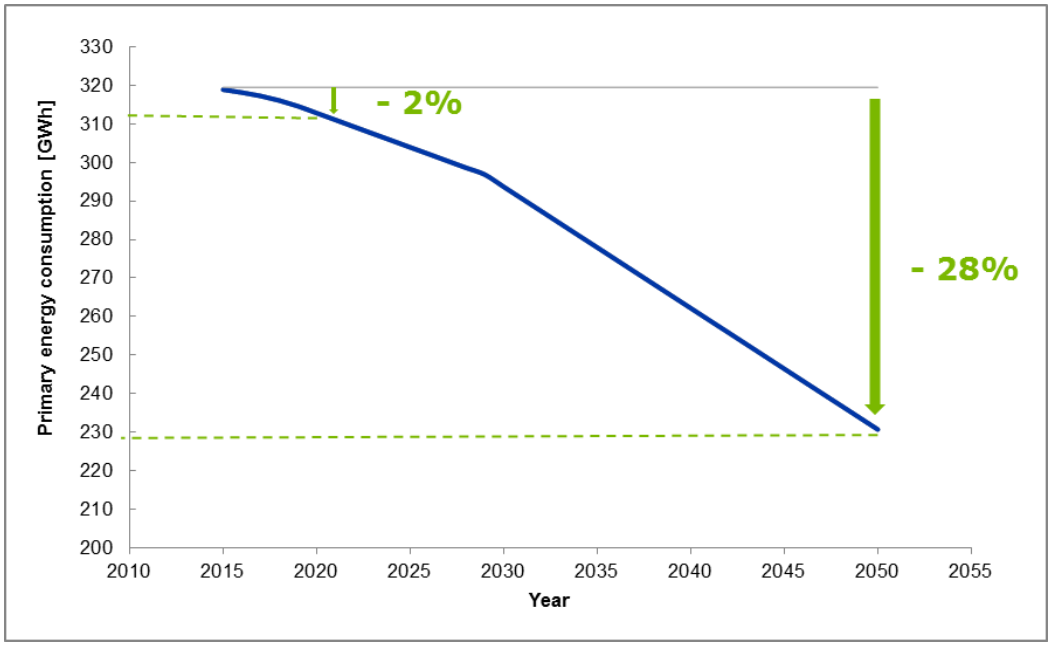

Figure 4 Reduction in primary energy consumption following the renovation strategy

This means that by 2020 **energy savings of 6.7 GWh of primary energy** can be achieved following this strategy, based on the reference buildings and energy savings presented in the cost optimality assessment. Furthermore, in **2050 overall savings of 88.8 GWh of primary energy** are achievable through the renovation of Gibraltar's older buildings and dwellings to cost optimal level.

This corresponds to roughly a 28% reduction in primary energy consumption from the current situation. In order to further reduce the primary energy consumption in Gibraltar's building stock, further measures would need to be explored. For instance, additional reduction potential lies in increasing the share of renewable energy (centralised or decentralised) in Gibraltar's electricity generation. Moving to greener solutions in this respect, will further reduce primary energy consumption, as well as greenhouse gas emissions, and will help Gibraltar stay in line with the EU's long term targets.